

Estimate for the Work of Comprehensive Operation and Maintenance of 4 MLD TTP of Membrane Technology at Cubbon Park for the period of Three Years.				
Scope of work: Comprehensive Operation and Maintenance of 4 MLD TTP of Membrane Technology at Cubbon Park including minor and major repairs to all the equipments inside the STP premises and in the treated water distribution line under the scope of BWSSB, supply of all spares required for the operation of the plant, supply of oil and lubricants, supply of supervisory and security staff, maintenance of gardens and trees and except power charges inclusive of all incidental items of work round the clock for a period of three years.				
SL. No.	Item Description	Unit	Nos	Qty
	Cost of Manpower -The cost shall be Inclusive of cost required for the weekly off of the staff (i.e. round the clock and throughout per year the minimum staff shown in the tender shall be present excluding Plant Manager and Chemist in the 2nd and 3rd Shifts) inclusive of service tax, ESI,PF and other statutory costs of the all the deployed Staff including reliving staff and no extra cost is admissible.			
1	Plant-Process Manager -Process manager shall be a Graduate in Environmental Engineering with at least five years experience in the operation and maintenance of wastewater treatment plant or Postgraduate in Environmental Engineering with at least three years experience in the operation and maintenance of wastewater treatment plant	Man Month	1x12	
	1st Year		1x12	12.00
	2nd Year		1x12	12.00
	3rd year		1x12	12.00
2	Instrumentation engineer - Instrumentation engineer shall be a Graduate in Instrumentation Engineering or equivalent with at least five per years experience in which Three year experience in Water and waste water treatment plants or Postgraduate in similar stream with at least three years experience in which Two year experience in Water and waste water treatment plants.	Man Month	1x12	
	1st Year		1x12	12.00
	2nd Year		1x12	12.00
	3rd year		1x12	12.00
3	Analyst/Lab Analyst (chemist) -The Analyst shall be Graduate in Science with Chemistry as major subject having at least Three years of Laboratory experience	Man Month	1x12	
	1st Year		1x12	12.00
	2nd Year		1x12	12.00
	3rd year		1x12	12.00
4	Lab Assistant - PUC/12th Class with science background with 2 years of experience.	Man Month	1x12	
	1st Year		1x12	12.00
	2nd Year		1x12	12.00
	3rd year		1x12	12.00
5	Electrician/Operator - 1 in 3 shifts (Electrician has to be deployed during weekly off and for this one extra man power has been considered) Electrician shall be ITI Certificate holders having at least 3 per years experience.	Man Month	[1*(3)]+1 4x12	
	1st Year		4x12	48.00
	2nd Year		4x12	48.00
	3rd year		4x12	48.00

SL. No.	Item Description	Unit	Nos	Qty
6	Helper -1 in 3 shifts for each stream (Helper have to be deployed during weekly off and for this one extra man power has been considered) 2 in General shifts for office and building maintenance, road cleaning, keeping plant premises neat and clean etc. (Sunday is weekly off) Helper shall be utilized for monitoring/ inspection/operation of valves in the treated water distribution lines	Man Month	[1*(3)]+1+1 5x12	
	1st Year		5x12	60.00
	2nd Year		5x12	60.00
	3rd year		5x12	60.00
7	Fitter - 2 in General shifts or in shifts as per requirement (Fitter has to be deployed daily by managing weekly off) Fitter shall be ITI Certificate holders having at least 3 years experience.	Man Month	1x12	
	1st Year		1x12	12.00
	2nd Year		1x12	12.00
	3rd year		1x12	12.00
8	Peon - 10th pass 1 in General Shift	Man Month	1x12	
	1st Year		1x12	12.00
	2nd Year		1x12	12.00
	3rd year		1x12	12.00
9	Sludge Handlers -2 in General shifts or in shifts as per requirement	Man Month	1x12	
	1st Year		1x12	12.00
	2nd Year		1x12	12.00
	3rd year		1x12	12.00
10	Security Staff -1 in 3 shifts (Security staff has to be deployed during weekly off and for this one extra man power he been considered) for STP security and to maintain the register/books of treated water details	Man Month	(3+1)	
	1st Year		4x12	48.00
	2nd Year		4x12	48.00
	3rd year		4x12	48.00

SL. No.	Item Description	Unit	Nos	Qty
11	Laboratory chemicals for conducting inhouse Lab analysis-all the chemicals for conducting routine such as pH, BOD, TSS, COD, Total Coliform, and Fecal coliform, including the reagents for conducting the tests using available spectrophotometer. Maintenance of the Laboratory is included. All necessary items required for the complete/routine testing as per procedure of the samples is included. The cost shall be inclusive of all the Items required for completion of the Item. a) Routine tests /Daily tests to be carried out for the raw sewage and effluent of the composite sample 1) pH 2) Total Suspended Solids 3) Turbidity 4) Total Residual Chlorine 5) Dissolved Oxygen 6) BODs 7) COD 8)Total Coliform Test 9) Fecal Coliform and including Daily Tests to be conducted mainly for the 7+ parameters tested/insisted by KSPCB as per latest prevailing norms required for legal compliance to KSPCB/CPCB. b) Tests to be conducted once in a month from the External Laboratory approved by MOEF/KSPCB/CPCB for raw and effluent of the composite sample for all the following parameters including the above parameters totaling to 32 parameters 1) Conductivity 2) Ammonical Nitrogen 3) Sulphates 4) Lead 5) Arsenic 6) Chromium 7) Nickel 8) Zinc 9) Chromium 10) Selenium 11) Boron 12) Cyanide 13) Chlorides 14) Fluorides 15) Copper 16) Cadmium 17) Mercury 18) Pesticides 19) Phenolic compounds 20) Sodium absorption ratio 21) Residual sodium carbonate 22) Bioassay Test 23) Total Phosphorous as P, mgl etc c) Requirement of Chemicals for conducting tests in the laboratory: For COD Test 1) Potassium dichromate 2) Ferrous Ammonium Sulphate 3) Concentrate Sulphuric acid 4) Silver sulphate 5) Mercury Sulphate 6) Ferroin indicator /For DO Test 1) Manganese sulphate Monohydrate 2) Sodium Hydroxide 3) Potassium iodide 4) Sodium azide 5) Conc. Sulphuric Acid 6) Sodium Thiosulphate Pents hydrate 7) Starch Soluble /For BOD Test: 1) Magnesium Sulphate heptahydrate 2) Ferric chloride 3) Phosphate Buffer 4) Pottasium Hydrogen Phosphate 5) DI Potassium Hydrogen Phosphate 6) Di sodium hydrogen phosphate 7) Ammonium Chloride /For Fecal and Coliform Test: 1) Thiopeptone or Thiotone 2) Casitone of Trypticase 3) Yeast extract 4) Lactose 5) Sodium Chloride 6) Di Potassium Hydeogen Phosphate 7) Potassium DI-Hydrogen Phosphate 8) Sodium Lauryl Sulphate 9) Sodium Desoxychloride 10) Sodium Sulphate 11) Basic Fuchigin 12) Alcohol 13) Conductivity solution 14) Free chlorine reagent 15) pH Buffer solution 4.oit 16) pH Buffer solution 10.0 lt Not limited to above and includes any other item left out to complete the job for legal compliance to KSPCB/CPCB.			
	1st Year	Job	1x12	12.00
	2nd Year	Job	1x12	12.00
	3rd year	Job	1x12	12.00
12	Maintenance of Laboratory consumables & Laboratory equipments- <u>A) Laboratory consumables :</u> The glassware's required for the testing has to be supplied. Any breakages in the glassware shall be immediately replaced. The cost shall be inclusive of all the items required for completion of the Item. 1) Whitman filter paper 2) Petri plates 3) Dessicator small 4) Nickel SS Spatula; small 1 no & large 1 5) Glass rods15 cm 6) Nickel crucible 50m1 7) Measuring cylinder, 1000m1 8) Measuring cylinder, 500ml 9) Measuring cylinder, 250ml 10) Measuring cylinder, 100ml 11) Measuring cylinder, 50ml 12) Measuring cylinder, 10ml 13) Volumetric flask, 1000ml 14) Volumetric flask, 500ml 15) Volumetric flask, 250ml 16) Volumetric flask, 100ml 17) Volumetric flask, 50ml 18) Conical flask, 500ml 19) Conical flask, 250ml 20) Conical flask, 150ml 21) Burette, 50ml 22) Burette, 25ml 23) Burette, 10ml 24) Beaker, 500ml 25) Beaker, 250ml 26) Beaker, 100ml 27) Amber reagent bottle, 500ml 28) Amber reagent bottle, 250ml 29) Amber reagent bottle,150ml 30) BOO Bottle, 300ml 31) COD, Round bottom flask, 500ml 32) Condenser 33) Pipette, 10ml 34) Pipette, 5ml 35) Pipette, 2ml 36) Pipette, 1ml 37) Bulb Pipettes, 50ml 38) Bulb Pipettes, 25ml 39) Bulb Pipettes, 50ml 40) Bulb Pipettes, 5ml 41) Cellulose Membrane, 0.45 (23 nos) 42) Filler, small 43) Porcclain dish, 50ml 44) Plastic wash bottle, 500ml 45) Plastic can : 2 liters 46) Plastic can : 1 liter 47) Burette Stand, 2 sides 48) Pipette stand, 2 sides 49) Plastic cylinder, 50ml 50) pH Paper booklet Miscellaneous Items <u>B) Maintenances (Repair/replace)of Laboratory equipments including supply of equipments to test the parameters to meet legal compliance to KSPCB/CPCB :</u> 1) BOD Incubator 2) COD hot plate 3) Open reflux apparatus 4) pH meter 5) Thermometer 6) Physical Balance 7) Hot air oven 8) Chlorometer 9) Refrigerator 10) Spectrophotometer 11) BOD Track Instrument 12) Turbidity meter 13) Magnetic Stirrer with hot plate 14) Digital colony counter 15) Suction pump 16) Membrane filtration assembly 17) Bacteriological Incubator 18) Miscellaneous items Not limited to above and includes any other item left out to complete the job for legal compliance to KSPCB.			
	1st Year	LS	1x12	12.00
	2nd Year	LS	1x12	12.00
	3rd year	LS	1x12	12.00

SL. No.	Item Description	Unit	Nos	Qty
13	For office maintenance: Establishment / Office Expenses / Stationery / Printing - The stationary required for furnishing the reports such as Paper, Cartridges, File folders, Registers, writing materials etc. are included. The printing of the Log books in the prescribed proforma has to be carried out. The print outs shall be attached to the monthly reports. The cost shall be inclusive of all the items required for completion of the item, etc. a) office Maintenance b) Internet charges c) Computer Maintenance-2 No's d) Printer maintenance-1 No e) Printing paper-A4 size f) Printing paper-A3 size g) Printing Cartridge replacements h) File Folders i) Printing of main log book j) Registers for each unit k) Writing materials l) Miscellaneous Items. Not limited to above and includes any other item left out to complete the job.			
	1st Year	LS	1x12	12.00
	2nd Year	LS	1x12	12.00
	3rd year	LS	1x12	12.00
14	Transportation and Disposal of Grit and Sludge -the grit / sludge generated in the Grit chamber / Centrifuge and sludge drying beds have to be collected and transported outside in the environmentally friendly manner. The waste generated in the treatment plant site shall also be disposed off. The cost shall be inclusive of all the Items required for completion of the Item. A) Wheel barrows b) Tractor/Lorry charges etc.			
	1st Year	LS	1x12	12.00
	2nd Year	LS	1x12	12.00
	3rd year	LS	1x12	12.00
15	Maintenance consumables for Cubbon Park Plant: Oil and Grease - the Oil and grease, Distilled Water ,Welding Rods, Cotton waste CRC, Insulation Tapes, Teflon Tape , Gland, Gasket Miscellaneous etc required for the O&M of the plant shall be supplied. The quantities and replacement period shall be carried out as per the lubrication chart. The cost shall be Inclusive of all the items required for completion of the Item.			
	1st Year	LS	1x12	12.00
	2nd Year	LS	1x12	12.00
	3rd year	LS	1x12	12.00
16	Major and Minor Maintenance and Insurance of Plant and Equipment: All the major and minor repairs of Civil, mechanical electrical and Instrumentation & automation equipments are to be carried out. The spares required for this and also any replacement required in all the mechanical, electrical equipments and Instrumentation & automation equipments are included in this item. Whatever the spares required for all major and minor repairs shall be provided even though they are not listed in detail.The cost shall be Inclusive of all the items required for completion of the item. a)Repairs/Replacement Includes All plant and equipments installed/comissioned/operated by BWSSB within the premises of TTP including Pump &macheneries related to GLR and Pipeline & equipments in the existing treated water distribution line from TTP GLR along with leakage attending. b) Electrical inspectorate compliance charges and Annual Maintenance of DG Set : certification & calibration report from first class contractor [Includes Transformer oil Filtration,Testing of KWH Meters, CT's, Relay, Earthing & Painting of Transformer & Fencing by silver paint through Spray Gun For all Transformer) along with providing insulation mats , Fire extingusier refills and Fire Buckets and necessary items.Maintenance of DG Set with periodical checks, battery maintenance, AMF panel replacement of coolant, oil filter, diesel filter ,etc. complete along with necessary B-Check C.Check in compliance with electrical inspectorate c) Servicing and calibration of Instruments d) Maintenance of Garden and landscaping, Street Lightings and Building Lightings e) Emptying the Aeration Tank and removing of Settled slit and Servicing of Diffuser system and maintenance of the same, , Miscellaneous f)Safety items required for O&M for TTP i.e., All the required safety items shall be supplied such as First aid Kit, Uniforms, Safety items, Gumboots, Safety helmets, Masks, Hand gloves, goggles, Safety belt, Apron for chemical handlingWind scok, lifebuoys, fire extinguisner, sand buckets etc. g)The required Insurance for the Plant and Equipment shall be carried out. Miscellaneous items which are not included in the list, but not limited to shall be carried out for smooth operation of TTP with all legal compliance.			
	1st Year	LS-Qtr	1x4	4.00
	2nd Year	LS-Qtr	1x4	4.00
	3rd year	LS-Qtr	1x4	4.00

SL. No.	Item Description	Unit	Nos	Qty
17	SCADA & PLC spares and maintenance for Cubbon Park- BMXCPS2000 STANDARD AC POWER SUPPLY,BMXDD03202K DIG 32Q TRANS SOURCE 0.1A,BMXAMIO800 Ana 8 U/I In No Isol Fast ,BMXDDI3202K DIG 321 24 VDC SINK,BMXXBE1000 STANDARD BACKPLANE EXTENDER, BMXAMO0802 Ana 8 Current Out No Isol and others including Maintenance of SCADA Computer, AC DC Convector LAN Cable UPS UPS batteries DIGISOL Adapters for communication,Rack, communication cables and other miscellaneous etc Not limited to above and includes any other item left out to complete the job.			
	1st Year	LS-Qtr	1x4	4.00
	2nd Year	LS-Qtr	1x4	4.00
	3rd year	LS-Qtr	1x4	4.00
18	Diesel Charges for DGset			
	1st Year	Ltr	1.00	7500.00
	2nd Year	Ltr	1.00	7500.00
	3rd year	Ltr	1.00	7500.00
19	Supply of Polymer for Dewatering Sludge in Centrifuge -Supply and delivery at Cubbon Park B13 treatment plant of Polymer DK SET ; P3 110 marketed by M/s Dai-ichi-karkaria limited, D13 MIDC, KurKumbh, Tail, Daund District, Pune 413106 of equivalent approved make for Dewatering Sludge in Centrifuge to be supplied in 25 kg Polythene pack. Polymer required per day 1 kg/day, therefore required polymer per year =365 kg for full capacity operation			
	1st Year	kg	1.00	400.00
	2nd Year	kg	1.00	400.00
	3rd year	kg	1.00	400.00
20	Supply of Sodium Hypo chlorite Solution A) <u>Supply of Sodium Hypo chlorite Solution for Disinfection at Cubbon Park</u> -Supply and delivery at Cubbon Park treatment plant of Sodium Hypo Chlorite with 10% strength chlorine available in 40 kg plastic cans recommended percent strength of solution to be prepared for dosing equals to 2 to 4%, Sodium Hypo chloride dose 3 mg/ltr therefore required sodium hypo chloride per day 3x10x4= 120 kg/day, per month = 120x365=43800 kg/year for full capacity operation. B) <u>Supply of Sodium Hypo chlorite Solution for Back Pulsing of Membranes at Cubbon Park</u> -Supply and delivery at Cubbon Park treatment plant of Sodium Hypo Chlorite for back pulsing of membranes for every 10 to 15 minutes @ 30 to 45 seconds to prevent organic and Inorganic fouling of membrane cartridges. Required Hypochlorite for chlorine concentrations 5 mg/liter using commercial grade of sodium Hypochlorite with available chlorine of 10% concentration. For single stream Chlorine concentration 5 mg/liter hypochlorite required = 0.5 kg/day hence with 10% strength chlorine = 0.5 x 10 = 5Kg/day. For Both Streams per Year 2 x 5 x 365 = 3650 kg/ Year for full capacity operation for both stream. C) <u>Supply of Sodium Hypo chlorite Solution for maintenance cleaning of Membranes at Cubbon Park</u> -Supply and delivery at Cubbon Park treatment plant of Sodium Hypo Chlorite for maintenance cleaning of membrane cartridges 3 times/week by back pulsing with solution of sodium Hypo chlorite of Chlorine concentration of 260 Mg/L designed for upto 500 Mg/L shall be dosed for 7 to 10 minutes the overall duration of each maintenance cleaning will be 70 to 90 minutes Including various cleaning operation. For 2Nos of 55Cum/Hr and 7 minutes duration solution required = 2 x 60 x 7/60 = 14cum = 14000 liters therefore Chlorine required at 250Mg/L = 250 x 14000 = 35,00,000Mg= 3.5 Kg (available chlorine is with 10% concentration) so required sodium Hypochlorite required/cleaning = 3.5/0.1=35Kg For a one year 35 *122= 4270 KG/Year for single stream. (8540 /year for both stream) D) <u>Supply of Sodium Hypo chlorite Solution for Recovery cleaning of Membranes at Cubbon park</u> -Supply and delivery at Cubbon Park treatment plant of Sodium Hypo Chlorite for recovery cleaning of membrane 2 times a per year to prevent organic and inorganic fouling of membrane cartridge, for the required Chlorine concentration of 1000 Mg/L commercial grade sodium hypochlorite available is of 10% chlorine only tank capacity=31 x 25 x 3 =23.25cum by deducting 20% for membrane cartridges pipes and frame 21.25cum= 21250 Liter required chlorine = 21250 x 1000=21250000Mg=21.25Kg = 21.25/0.1 =212.5 Kg for twice cleaning in 4 per year =212.5 x 2 x 4 = 1700 kg/year for Both Stream A and B			

SL. No.	Item Description	Unit	Nos	Qty
	1st Year	kg	1.00	60000.00
	2nd Year	kg	1.00	60000.00
	3rd year	kg	1.00	60000.00
21	Supply of Citric Acid Solution A) <u>Supply of Citric Acid Solution for maintenance cleaning of Membranes</u> -Supply and delivery at Cubbon Park treatment plant of Citric Acid for maintenance cleaning of membrane cartridges 1 time/day by back pulsing with solution of Citric Acid concentration of 2000 Mg/L shall be dosed for 7 to 10 minutes. The overall duration of each maintenance cleaning will be 70 to 90 minutes including various cleaning operation. For 2 Nos of 60Cum/Hr and 7 minutes duration solution required= 2 x 60 x 7/60= 14 cum = 14000 liters therefore Citric Acid required at 2000Mg/L= 2000 x 14000 = 28000000Mg= 28 Kg Citric Acid (Commercial available Citric Acid is with 30% concentration) so required Citric Acid/cleaning =28/0.3= 90Kg = 1 x 52 x 90= 4680 KG/year/stream (9360/year for both stream) B) <u>Supply of Citric Acid Solution for Recovery cleaning of Membranes</u> -Supply and delivery at Cubbon Park treatment plant of Citric Acid for Recovery cleaning of Membrane 2 times a per year to prevent organic and inorganic fouling of membrane cartridge. Required Citric Acid concentration of 2000 Mg/L commercial grade Citric Acid available is of 30% concentration. Tank capacity 31 x 25 x 3 = 23.25 cum by deducting 20% for membrane cartridges pipes and frame 21.25cum= 21250Litre required Citric Acid = 21250 x 2000=42.5 Kg = 42.5/0.3 = 141.67 Kg for twice cleaning in one per year = 141.67 x 2 = 283.34 say 285 Kgs/membrane for twice a year. (for Four Membrane Recovery Cleaning twice a year is 1140kgs)			
	1st Year	kg	1.00	10500.00
	2nd Year	kg	1.00	10500.00
	3rd year	kg	1.00	10500.00
22	Painting all wall surface, including internal, external walls surfaces, handrails, shutter, doors, windows and ventilators, pipe lines structural member, Plant equipments, street lights etc.			
	1st Year	LS	1.00	1.00